



**TRANSPORT  
SCOTLAND**  
CÒMHDHAIL ALBA

# **Zero Emission Energy for Transport Report**

## **Regional Case Studies: Summary of Results**

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# 1. Overview

## 1.1 Introduction

This regional case study results summary builds on the accompanying **Zero Emission Energy for Transport: National Demand Forecasts for Electricity and Hydrogen** report. In addition to this national study, Transport Scotland also commissioned Jacobs to consider the potential hydrogen demand for transport in three specific regions of Scotland.

Several locations have already been identified for development within the [Draft Hydrogen Action Plan](#) as shown in **Figure 1**, which aim to host the entire hydrogen value chain within these specific regions. However, further work was required to understand specifically where and how much hydrogen might be required for transport. For the purposes of these regional studies, Jacobs focused forecasting on three regions: Dumfries and Galloway, Fife and the Highland Council areas.

These three regions were selected for specific study on the basis that they could benefit from a greater understanding of potential hydrogen demand for transport and that there were limited studies conducted in these regions to date.

For each region, three hydrogen transition scenarios were modelled for the purposes of forecasting potential future hydrogen energy demand for transport across these regions, they are shown in Table 1 below.

Scenario	Notation	Scenario
<b>A</b>	<b>Low</b>	Low transition to hydrogen
<b>B</b>	<b>Medium</b>	Medium transition to hydrogen
<b>C</b>	<b>High</b>	High transition to hydrogen

Table 1 - Hydrogen forecast demand scenarios

These three scenarios were selected for simplicity and flexibility, with the objective of estimating the range of annual hydrogen demand for domestic or intra-Scotland transport for road, rail, maritime and aviation transport annually between 2022 and 2030, and for 2035, 2040 and 2045 across the three regions.

It is hoped the results of this study contained herein, in the accompanying individual regional case studies and Microsoft Excel Tool (Tool) will help facilitate the deployment of both hydrogen production and end-use facilities, potentially within

these regions, by assisting the market to understand the potential local transport demand requirements for hydrogen. While understanding the potential infrastructure or technological constraints is also critical, it is not within the scope of these studies.

The purpose of this report is therefore to present results aligned with the ambitions of the Scottish Government's 2021 [Draft Hydrogen Action Plan](#), that is, to support the market in the creation of regional hydrogen energy hubs in Scotland this decade. The following sections first present hydrogen demand for each scenario across all years on a region-by-region basis; compare total hydrogen demand between the three regions for each scenario; before presenting hydrogen demand by transport modes for each scenario and region.

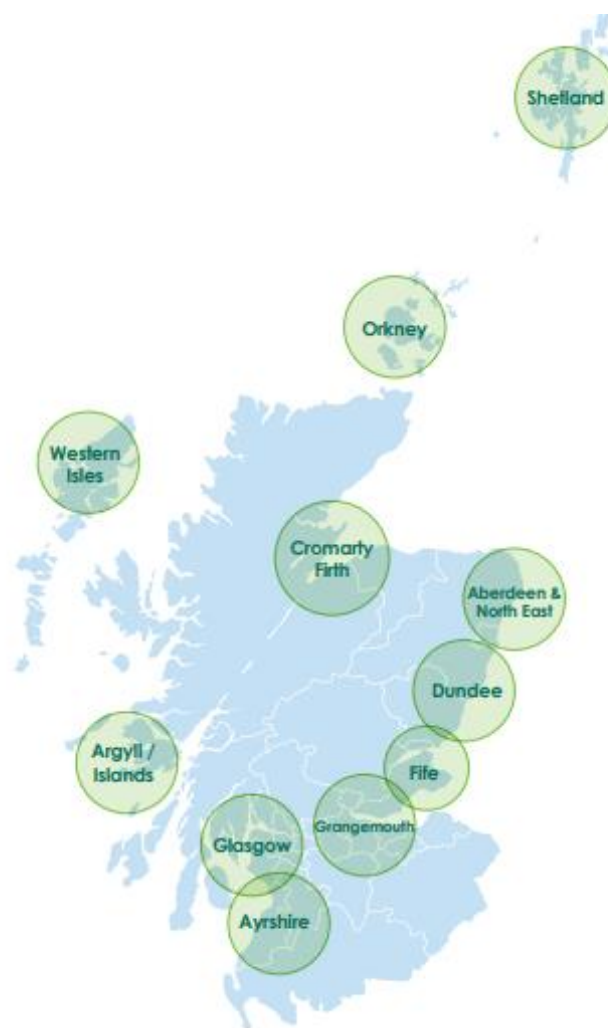


Figure 1 - Map showing potential locations of regional hydrogen hubs in Scotland, modified from the Scottish Government's 2021 [Draft Hydrogen Action Plan](#), page 2

## 2. Regional Hydrogen Demand Forecast Results

### 2.1 Dumfries & Galloway

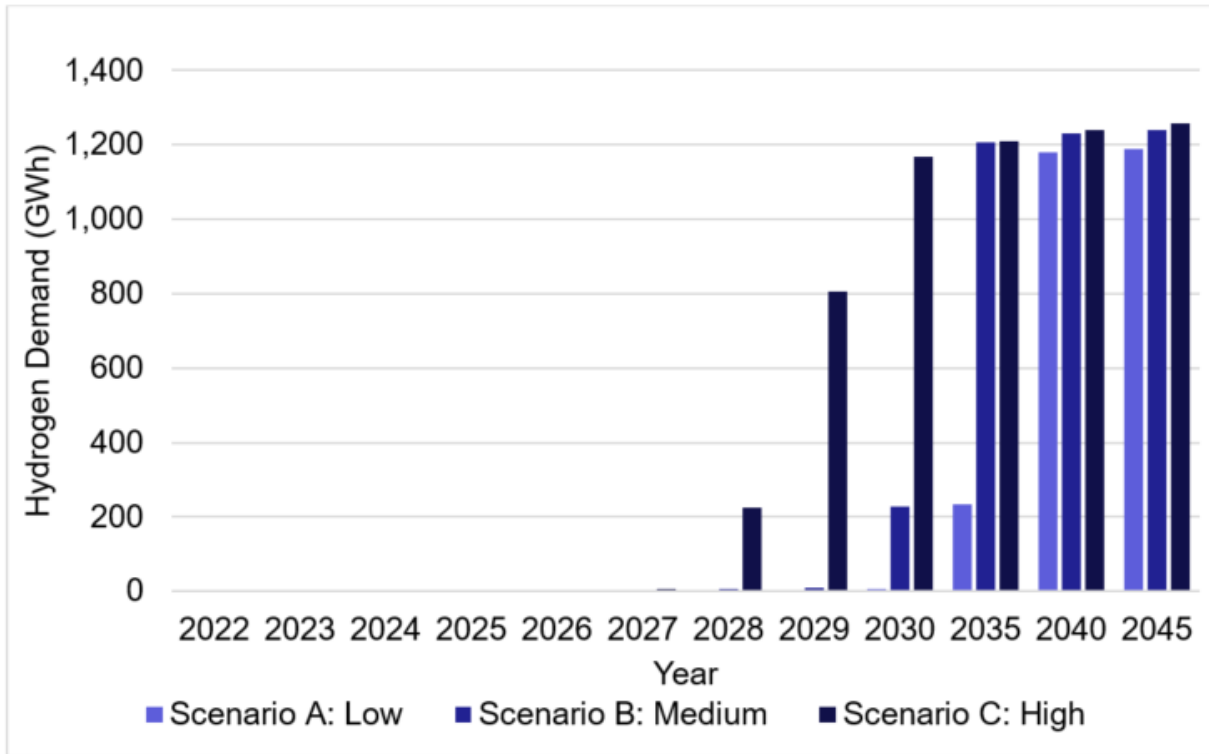


Figure 2 - Hydrogen demand in Dumfries & Galloway for each scenario across all years

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2022</b>	0.1	0.1	0.2
<b>2023</b>	0.2	0.2	0.2
<b>2024</b>	0.2	0.2	0.3
<b>2025</b>	0.2	0.3	0.4
<b>2026</b>	1.1	2.2	2.4
<b>2027</b>	2.1	4.4	7.1
<b>2028</b>	3.1	6.7	225.7
<b>2029</b>	4.3	9.1	804.6
<b>2030</b>	5.9	228.9	1168.6
<b>2035</b>	232.7	1206.0	1210.5

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2040</b>	1180.3	1229.3	1239.2
<b>2045</b>	1188.5	1240.7	1259.1

Table 2 - Data for hydrogen demand (GWh) in Dumfries & Galloway for each scenario

## 2.2 Fife

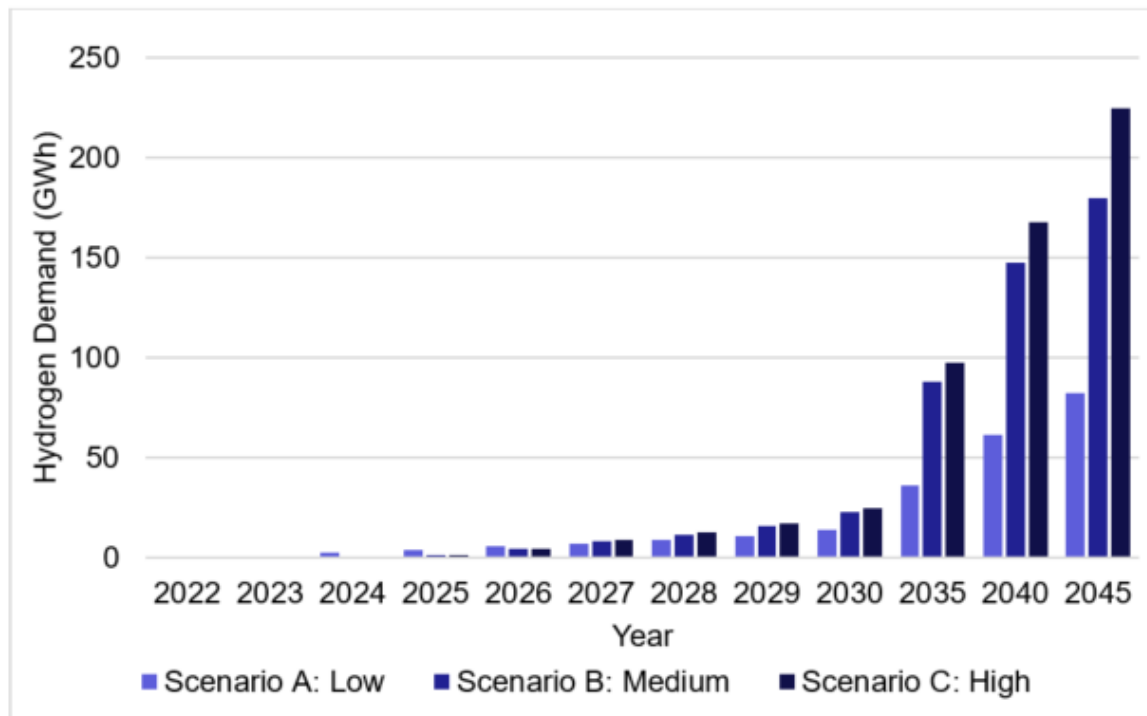


Figure 3 - Hydrogen demand in Fife for each scenario across all years

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2022</b>	0.3	0.4	0.5
<b>2023</b>	0.4	0.5	0.6
<b>2024</b>	2.2	0.6	0.8
<b>2025</b>	3.8	0.8	1.1
<b>2026</b>	5.3	4.1	4.6
<b>2027</b>	7.0	7.8	8.5
<b>2028</b>	8.7	11.6	12.4
<b>2029</b>	10.6	15.7	16.7
<b>2030</b>	13.7	22.4	24.8
<b>2035</b>	36.1	87.8	97.5

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2040</b>	61.5	147.2	167.7
<b>2045</b>	82.4	180.0	224.4

Table 3 - Data for hydrogen demand (GWh) in Fife for each scenario

## 2.3 Highland

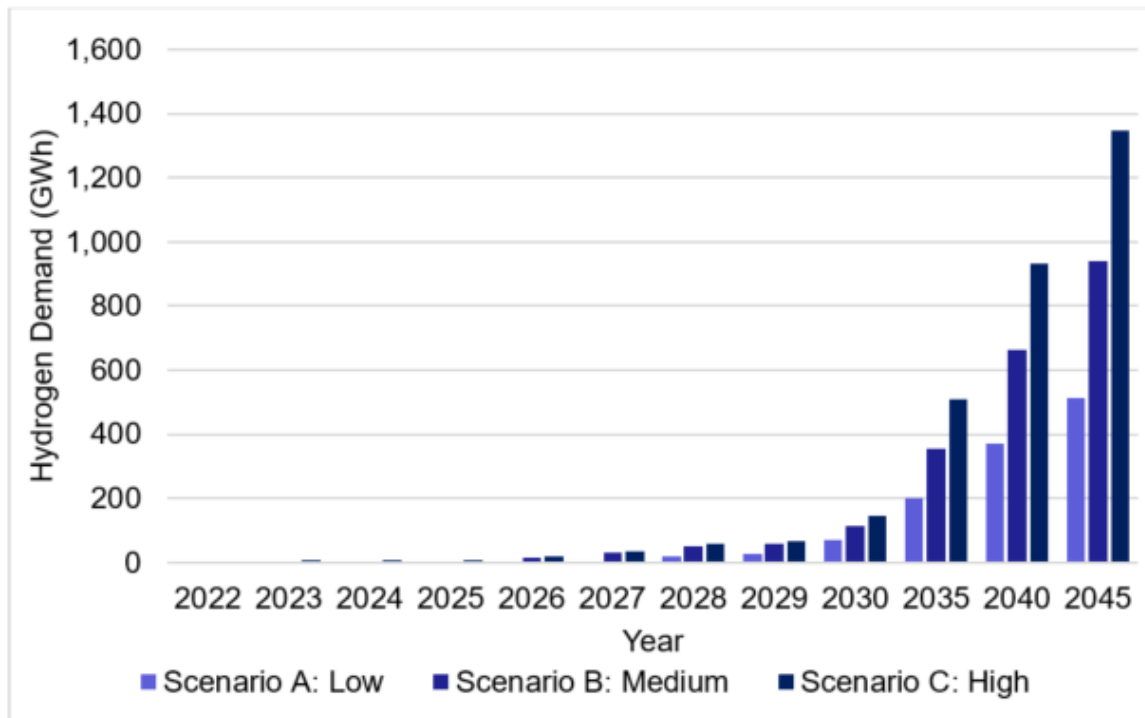


Figure 4 - Hydrogen demand in Highland for each scenario across all years

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2022</b>	0.2	0.3	2.9
<b>2023</b>	0.3	0.3	5.6
<b>2024</b>	0.3	0.4	5.7
<b>2025</b>	0.4	1.5	6.8
<b>2026</b>	1.0	15.0	20.5
<b>2027</b>	1.8	31.0	36.5
<b>2028</b>	18.6	51.9	57.5
<b>2029</b>	24.9	59.2	64.9
<b>2030</b>	72.1	114.3	143.9
<b>2035</b>	201.3	354.5	507.5

Year	Scenario A: Low	Scenario B: Med	Scenario C: High
<b>2040</b>	370.7	662.8	931.9
<b>2045</b>	511.6	941.0	1345.5

Table 4 - Data for hydrogen demand in Highland for each scenario

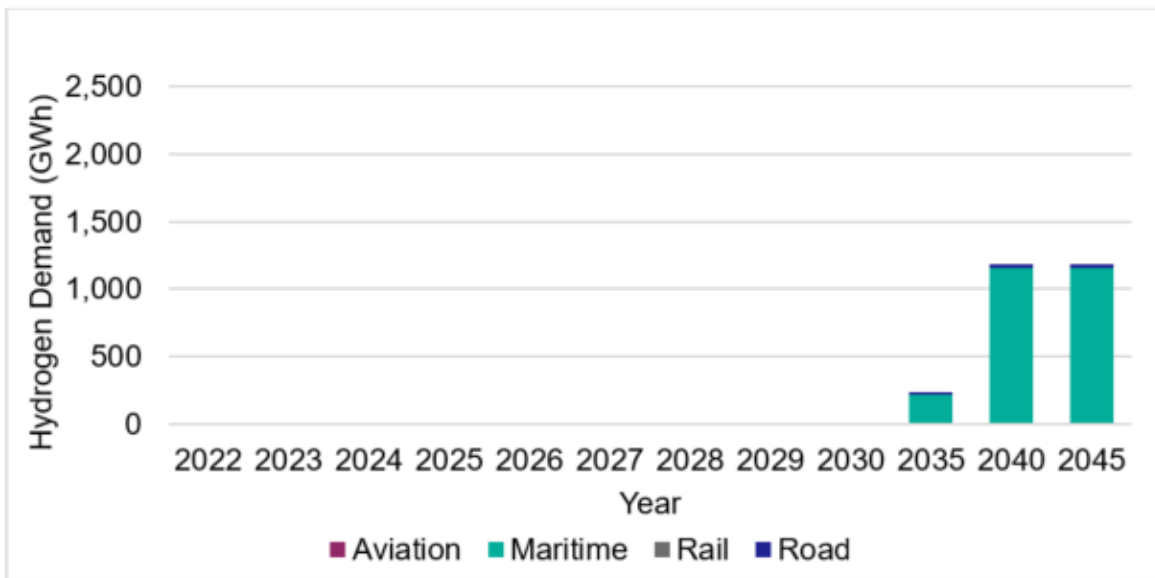


## 3. Regional Hydrogen Demand Forecast Results by Mode

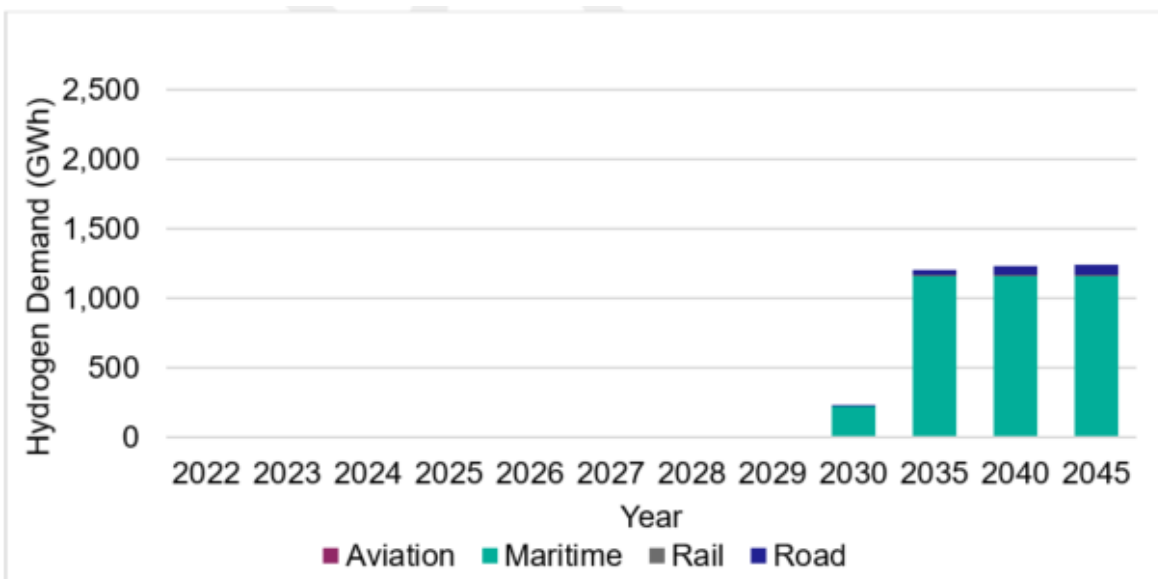
### 3.1 Dumfries & Galloway

The maritime sector makes up the majority of the hydrogen demand forecasted for Dumfries and Galloway, with a very small proportion coming from the road sector. Figure 5 below shows the hydrogen demand forecasts for Dumfries and Galloway by mode of transport.

**Scenario A: Low Hydrogen Demand**



**Scenario B: Medium Hydrogen Demand**



**Scenario C: High Hydrogen Demand**

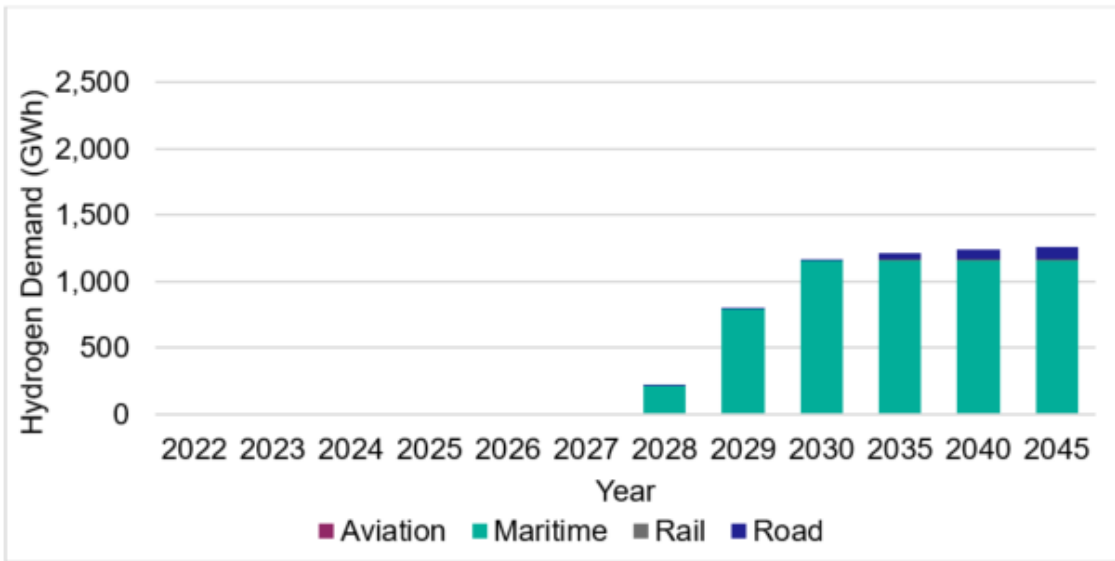
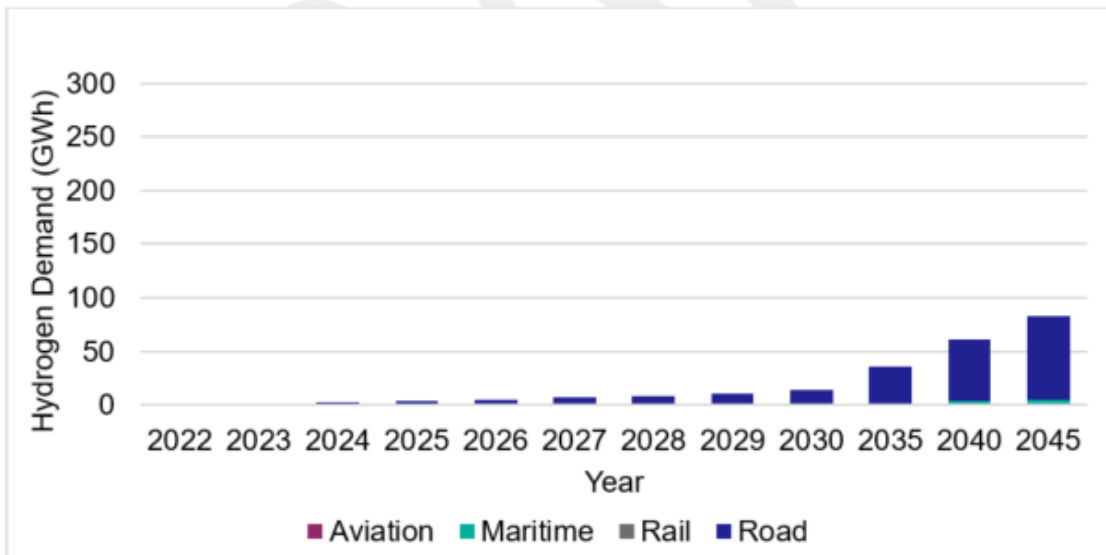


Figure 5 - Hydrogen demand in Dumfries & Galloway by mode for each scenario

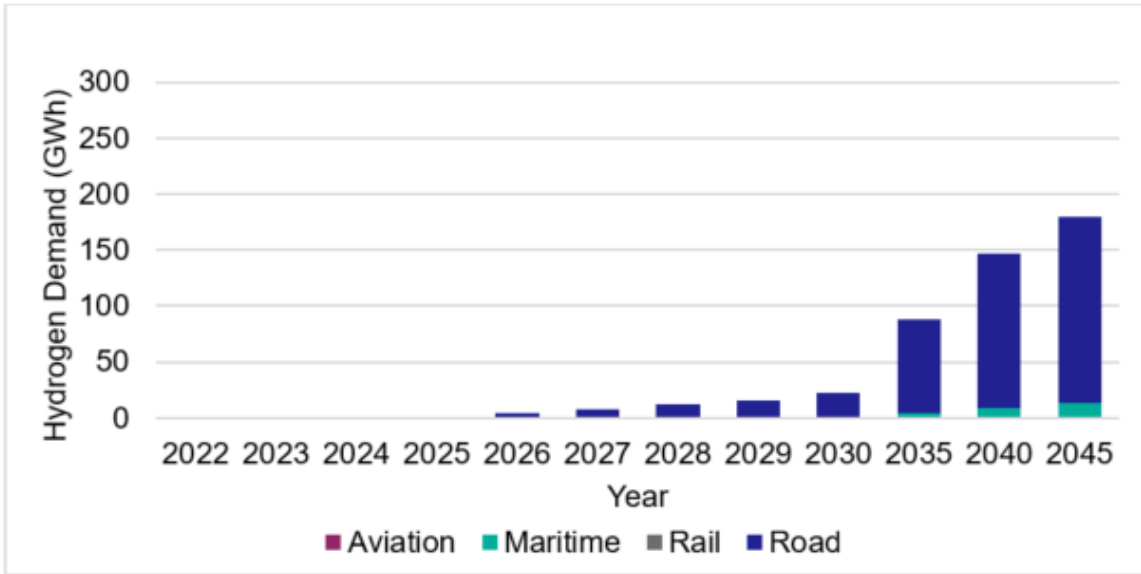
**3.2 Fife**

The road sector makes up the majority of the hydrogen demand forecasted in Fife in all scenarios. The maritime sector begins to take up a small proportion of demand from 2040 in the low scenario, and 2035 in the medium and high scenarios. Figure 6 below shows the hydrogen demand forecasts for Fife by mode of transport.

**Scenario A: Low Hydrogen Demand**



**Scenario B: Medium Hydrogen Demand**



**Scenario C: High Hydrogen Demand**

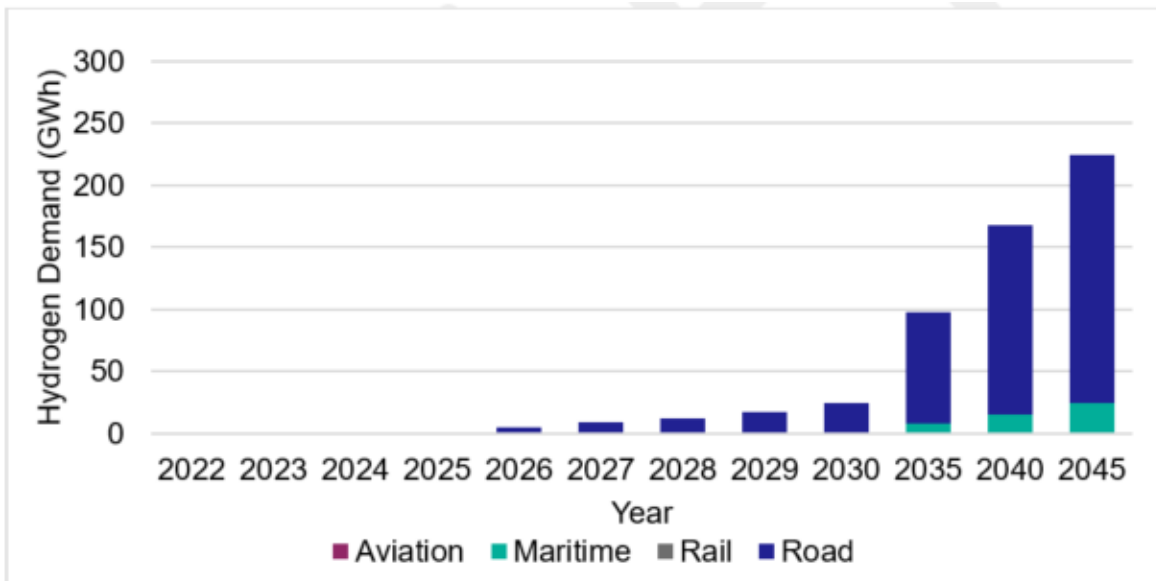
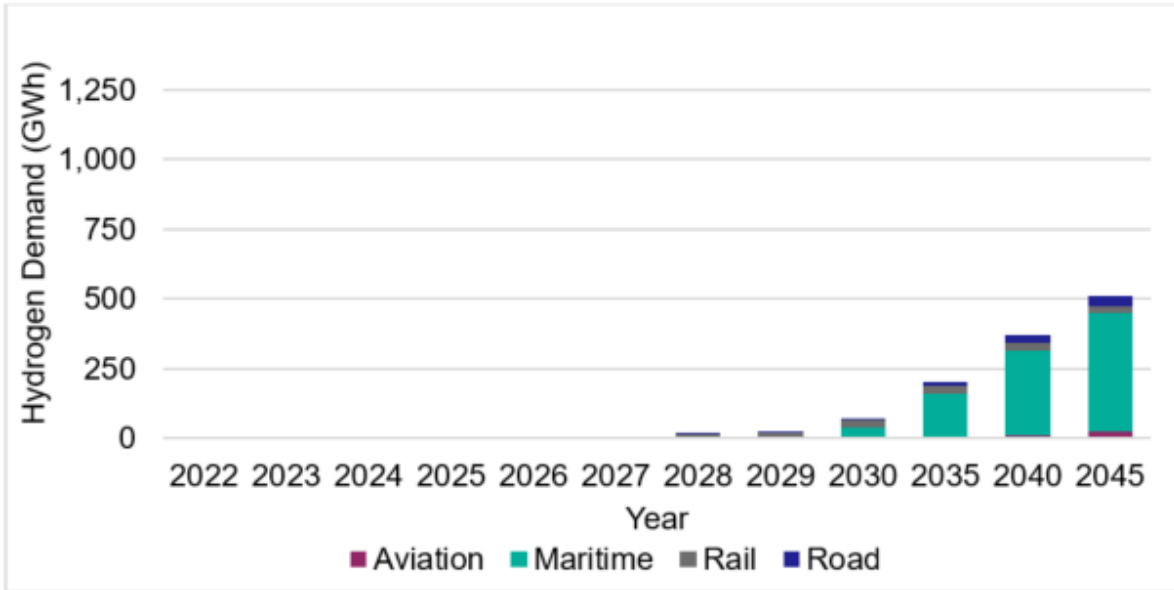


Figure 6 - Hydrogen demand in Fife by mode for each scenario

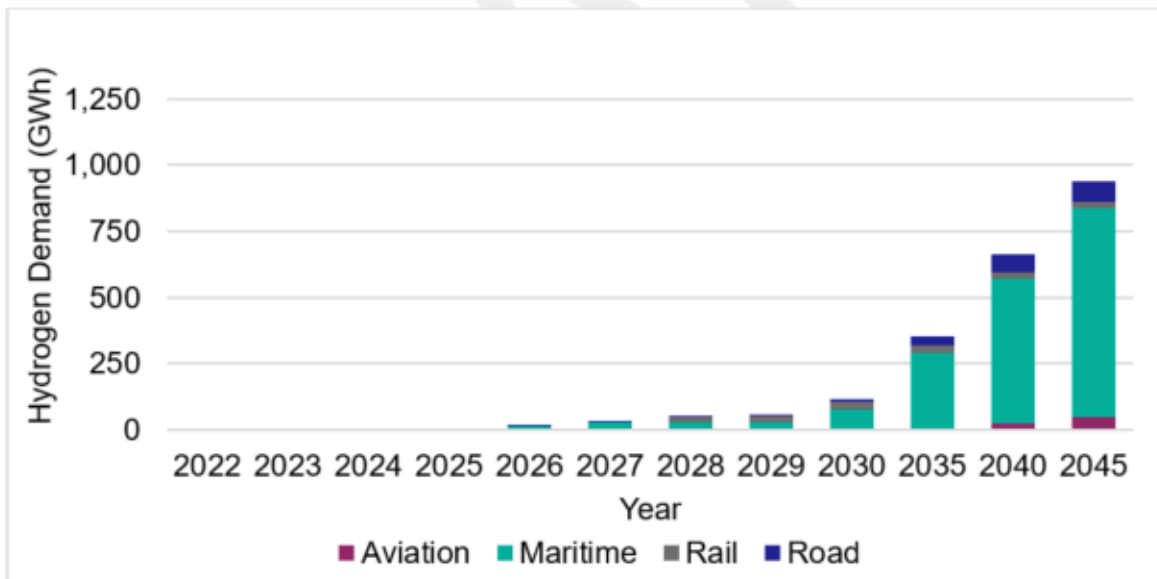
### 3.3 Highland

The maritime sector makes up the majority of the hydrogen demand forecasted in the Highlands. A small proportion of hydrogen demand is taken up by the three other sectors – road, aviation and rail – in all scenarios. Figure 7 below shows the hydrogen demand forecasts for the Highlands by mode of transport.

**Scenario A: Low Hydrogen Demand**



**Scenario B: Medium Hydrogen Demand**



### Scenario C: High Hydrogen Demand

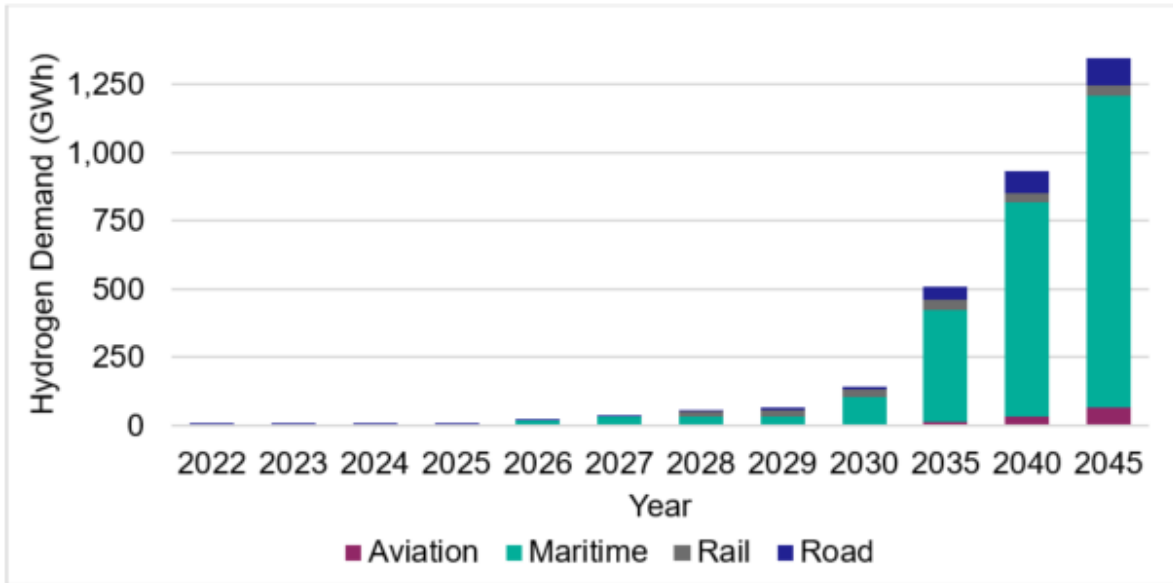


Figure 7 - Hydrogen demand in Highland by mode for each scenario

## 4. Regional Hydrogen Demand Forecast Comparison

In the low and medium hydrogen scenarios, Dumfries and Galloway’s hydrogen demand forecast is higher than the other two regions. In the high hydrogen scenario, the Highlands has a higher hydrogen demand forecast than Dumfries and Galloway. In all three scenarios, Fife has a significantly lower hydrogen demand forecast than the two other regions. Figures 8, 9 and 10 below show the hydrogen demand forecast by region for each scenario.

### 4.1 Scenario A

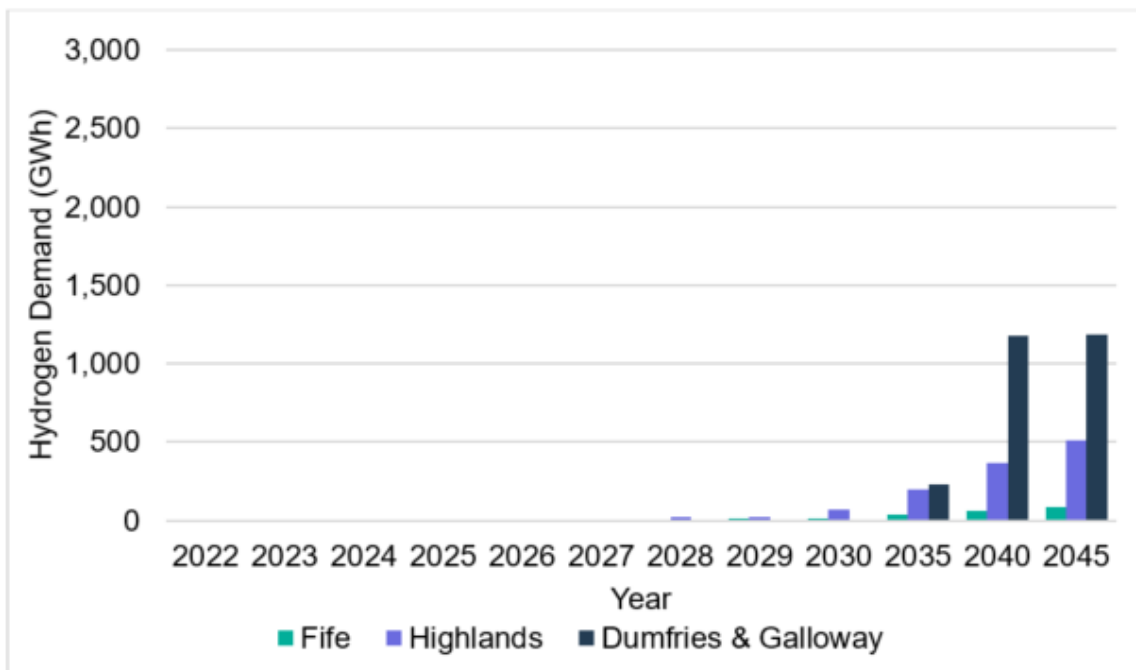


Figure 8 - Hydrogen demand by region for Scenario A (Low)

## 4.2 Scenario B

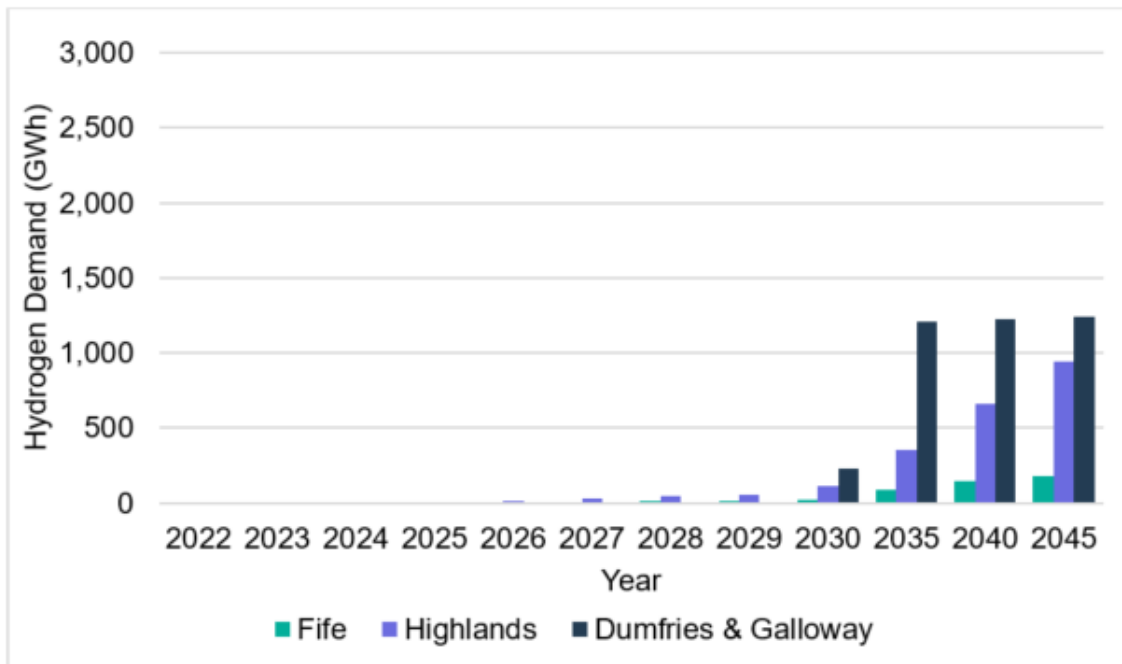


Figure 9 - Hydrogen demand by region for Scenario B (Medium)

## 4.3 Scenario C

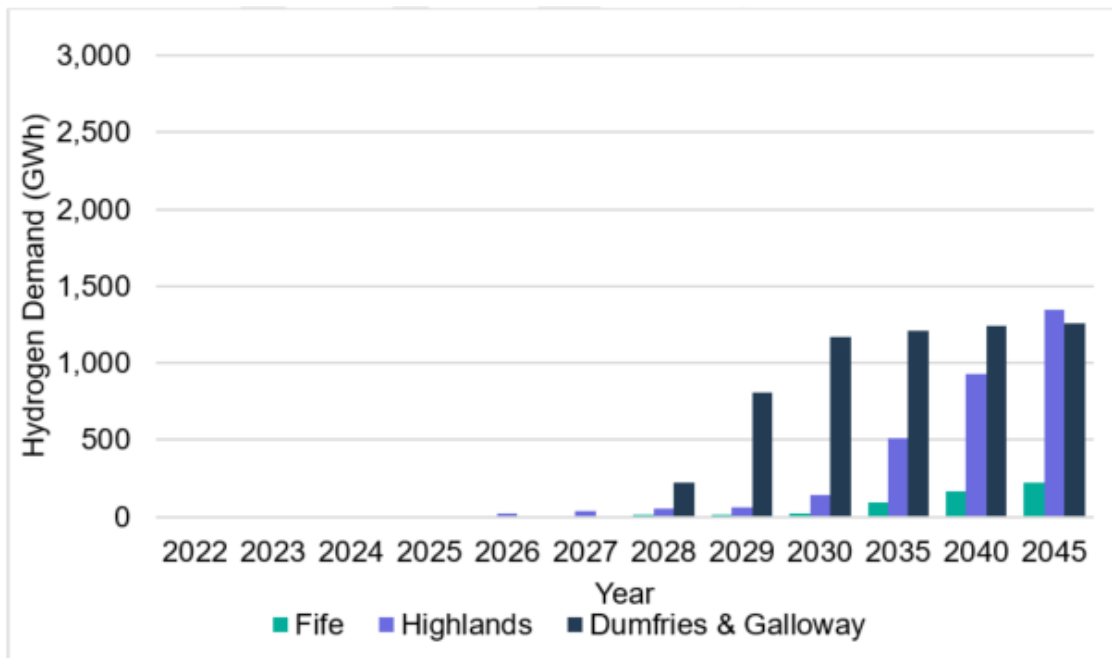


Figure 10 - Hydrogen demand by region for Scenario C (High)



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